

41. (Amended) In a machine-implemented method of generating a lexical knowledge base comprised of using a computer to parse a collection of texts to identify semantic relation structures, and storing data from said semantic relation structures in [the] a lexical knowledge base, an improvement comprising using the computer to iteratively parse the same collection of texts, successive parsings relying on successively enhanced versions of the lexical knowledge base, wherein semantic relations identified in one parsing operation serve to enhance discernment of semantic relations in subsequent parsing operations.

REMARKS

Claims 16-45 remain pending in the application. Claims 20-21, 24-30, 33-43 and 45 stand finally rejected as obvious over Lenat's Cyc project. Applicants respectfully submit the Final Rejection is premised on a factual misunderstanding of this art; additional publications are submitted herewith to provide further details on Lenat's work. Reconsideration is requested.

Title

The title has been amended to make it more descriptive. If the Examiner has a particular suggestion for a title, applicants would be pleased to consider same.

Drawings

Submitted herewith is a proposed drawing correction for Fig. 8 having the legend "Prior Art" added thereto.

§ 112

The claims have been amended to provide clearer antecedent basis for the phrase "generating a lexical knowledge base." In particular, the preambles of claims 16 and 20 have been amended to clarify that the "generating" includes all of the steps recited in the claim. In claim 41, antecedent basis has been provided by substituting the article "a."

The integration of claims 18 and 36 into their associated independent claims has been clarified by amendment.

The first collection of complex semantic relation structures in claim 18 do, indeed, relate to those extracted in step (b) of claim 16. The language of step (b) of claim 16 has been amended to make this relationship more apparent. Likewise, claim 30 has been amended to make this relationship in claim 36 more apparent.

The vagueness objections to claims 21 and 30 have been dealt with by substituting other language for the cited clauses.

Claim 33 has been amended to make clear that the semantic relation structure therein is the same as the semantic relation structure of claim 30.

If any § 112, ¶ 2 issue remains, the Examiner is invited to suggest alternative claim language that would redress same.

§ 103

Claims 20-21, 24-30, 33-43 and 45 stand rejected as obvious in view of the Lenat book.

The Office's analysis rests on two incorrect assumptions about Lenat's Cyc work.

1. The Office Incorrectly Presumed Lenat's "No Free Lunch" View was a Relic of the 1970s

First, the Office presumes that Lenat's teaching of "no free lunch" is a 1970s-era assessment of the world -- one superseded by advancement of technology in the past two decades.

While Lenat's "no free lunch" teaching may have first arisen out of his 1970s work, it is a view he still held when his cited book was published (1989), *and a view he still holds today*.

In a 1992 article on the subject,¹ a commentator reviews the Cyc project and cites a 1990 Lenat/Guha report in which these principal Cyc investigators argue:

there is no elegant, seemingly low-effort road to achieving large, complex KBs..."

This 1992 article goes on to particularly consider the class of techniques known as "natural language understanding" of documents -- the philosophical approach followed by applicants. Still citing Lenat's 1990 report, this philosophical approach is rejected:

¹ Berg-Cross, "Can a Large Knowledge Base be Built by Importing and Unifying Diverse Knowledge?: Lessons From Scruffy Work," Knowledge-Based Systems, Vol.5, No.3, pp.245-54, Sept. 1992.

Three low-effort candidates that they reject as a road to truly intelligent systems are shown in Fig. 1: the natural-language understanding of documents,.... Guha and Lenat reject natural-language understanding as a "free-lunch" route, because it requires a large amount of common-sense knowledge (shown in the natural-language knowledge-bases (NLKB) box in Fig. 1) to handle the extraction of knowledge from documents.

Contrary to this established 1990s teaching, applicants have found that the presently claimed combinations yield a rich semantic knowledge base -- one rich enough to support processing unrestricted text in NLP and provide some of the common sense knowledge that artificial intelligence requires.

While the undersigned has been unable, so far, to obtain a copy of Guha/Lenat's 1990 report,² an article by these authors appeared in 1991, entitled "Cyc: A Mid-Term Report." On the opening page they begin with the stark "truth":

Perhaps the hardest truth to face -- one that AI has been trying to wriggle out of for several decades -- is that there's probably no elegant, effortless way to *obtain* that immense knowledge base. Rather, the bulk of the effort must -- at least initially -- be manual entry of assertion after assertion.

(Emphasis in original)

² The undersigned received a copy of the MCC report on the eve of filing this amendment, and a copy is submitted herewith. The Guha/Lenat article appears to be an abridgement of the Guha/Lenat 1990 report. On page 3 the report states:

"Here are three notable candidates we've has to reluctantly rule out (as complete "free lunches"):

- Natural Language Understanding (NLU) is one tantalizing "free lunch" route: get a program to read English, say, then use it to rapidly build up the large KB (semi-)automatically..."

Applicants' work, in contrast, contravenes this "truth" and fulfills this long sought-after goal in AI. There *is* an elegant, effortless way to obtain an immense knowledge base -- it is the invention presently claimed. Such pioneering work, directly contrary to established teaching, was not an obvious approach to solution of this longstanding problem.

Within the past ten months (April, 1995), Lenat continued to argue that the "obvious" approach of machine natural language understanding should be avoided:³

Why *manually* construct it, rule by rule, rather than drawing on one or both of the obvious methods for building it up automatically and painlessly: machine learning (discovering new information automatically) and/or natural language understanding (gleaning information from already-written texts)? Very reluctantly, we concluded that in each case it would be premature to rely on those techniques, because they themselves required this selfsame large knowledge base in order to succeed.⁴

The foregoing makes evident that Lenat's "No Free Lunch" teaching is not a relic of the 1970s, but is Lenat's current teaching to artisans in the field.

2. The Office Incorrectly Presumed Lenat Believed Passage of Time, Alone, Would Make Natural Language Understanding a Viable Technique for Compiling a Knowledge Base

In Paper 7, the Office cited Lenat's book as teaching manual building of knowledge bases only until "natural language understanding begins to be a more effective way of further

³ Lenat, D.B., "Steps to Sharing Knowledge," Proceedings Second International Conference on Building and Sharing Very Large-Scale Knowledge Bases, April 10-13, 1995, pp. 3-6.

⁴ Page 5, top of col. 1.

enlarging" the knowledge base. The Office concluded therefrom that applicants' approach isn't shunned by Lenat; only avoided until the art advances.

But Lenat's 1995 writing makes clear what Lenat meant by the cited phrase, namely: natural language understanding won't be effective *until it can draw on a huge pre-existing knowledge base*.

In the 1995 writing quoted above, Lenat taught that it was "premature" (in 1995) to rely on natural language understanding because it requires "this selfsame knowledge base in order to succeed."

By 1995, the Cyc project had been in process for ten years, had generated "the first million or two rules," and had consumed *a person-century of effort*. *Ibid.* Yet as of the article's writing, Lenat still had not progressed to the point of using natural language understanding; that he planned for the following decade.

Applicants' invention, in contrast, requires no such prerequisite. It can automatically compile fundamental knowledge bases of the sort which Lenat counsels must be manually constructed.⁵

From the foregoing, it is evident that the art, even *after* the present application was filed, was *still* not sufficiently advanced for Lenat and followers of his teachings to pursue the approach perfected and particularly here claimed by applicants.

⁵ Once a knowledge base has been built, the knowledge thereby gained can be used to assist further processing of natural language sources, as discussed in applicants' specification. But the existence of a huge knowledge base is not a condition precedent in applicants' system, as it is in Lenat's teachings.

Lenat's Mistake

The inversion technique employed in the claimed combinations was not new to applicants. As discussed in the Background section of applicants' specification, it was known and employed by others in the field. Lenat knew of it too, as correctly observed by the Office.

Yet Lenat failed to recognize the tremendous power this technique could bring when applied in conjunction with the other elements of applicants' claimed combinations. He treated it as just another technique in the catalog of techniques his coders could employ in manually assembling a knowledge base, rather than the key which would enable the long-sought⁶ goal of automatic compilation of huge knowledge bases by natural language understanding.

Not "Common Knowledge and Common Sense"

The Final rejection relies on "common knowledge and common sense," without any specific hint or suggestion in a cited reference, as a rationale leading an artisan to make all the changes to Lenat necessary to yield each of applicants' claims 20-21, 24-30, 33-43 and 45.⁷

⁶ In the 1990 MCC report, Lenat noted that the quest for an elegant, effortless way to obtain an immense knowledge base had been continuing for 34 years. Page 3.

⁷ The view that "the conclusion of obviousness may be made from common knowledge and common sense of a person of ordinary skill in the art *without any specific hint or suggestion in a particular reference*," (a view first expressed in *In re Boznek*, 163 USPQ 545 (CCPA 1969)) seems to be waning in popularity. To avoid impermissible use of hindsight,

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Applicants respectfully submit that "common sense," as applied to Lenat's teachings, would lead an artisan away from applicants' techniques in view of the facts discussed above.

"Gist"

The MPEP counsels against considering the "gist" of an invention. (MPEP 2141.02.) Yet this is what seems to have been done in Paper 7; numerous limitations of applicants' claims are nowhere discussed or even acknowledged. Many of these limitations are neither found nor suggested in the sole cited reference.

"Contrary Teachings"

The MPEP counsels that the prior art must be considered for all it teaches, including contrary teachings. (MPEP 2141.02.) As shown above, Lenat's contrary teachings are not artifacts from decades past; they are views still held even after applicants' filing date. These contrary teachings must be considered.

the Federal Circuit increasingly looks for a citation to a prior art reference for a suggestion leading to the proposed combination/modification. Indeed, the Federal Circuit has never cited *In re Boznek* in any of its published opinions. More representative of the Court's current view is *In re Rijckaert*, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993), which held:

[W]hen the PTO asserts that there is an explicit or implicit teaching or suggestion in the prior art, it must indicate where such a teaching or suggestion appears...

"Reasonable Expectation of Success"

One of the three requirements of a *prima facie* case is "a reasonable expectation of success." (MPEP § 2142.) Given Lenat's clear and repeated teaching that natural language understanding is an unworkable "free lunch," this legal requirement of a *prima facie* case appears to be absent.

Respectfully submitted,

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